LISBON
SCHOOL OF
ECONOMICS &
MANAGEMENT
UNIVERSIDADE DE LISBOA

MASTER OF SCIENCE IN

FINANCE

MASTER´S FINAL WORK

DISSERTATION

EFFECTIVE TAX RATE IN EUROPEAN COMPANIES

AFARIN AHMADI AZARI

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SUPERVISOR:

JOAQUIM MIRANDA SARMENTO

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Abstract

This study aims to determine whether firm-specific characteristics have an influence on the company's effective tax rates. In our study, ETR has been defined in three ways as following: ETR1 defined as Logarithm of income tax divided by EBT, ETR2 as logarithm of income tax divided by normalized EBT, and ETR3 as Logarithm of cash tax paid divided by normalized EBT. The sample consisted of 450 public firms from 18 European countries from eight sectors listed on the Stoxx Euro 600 from 2002 to 2018. The independent variables used in this study are company size, leverage, capital intensity, inventory and Profitability jointly whereas the dependent variable is the company's effective tax rate. The results showed a negative sign for firm size, Leverage, capital intensity and profitability. Additionally, it indicated a positive relationship between inventory intensity and ETRs.

Key words: Effective Tax Rates; Firm size; Leverage; Capital Intensity; Inventory Percentage; Profitability.

Resume

Este trabalho pretende determinar como as características das Empresas têm influência no consequente tratamento Fiscal, nomeadamente na taxa efetiva de imposto.

No nosso estudo, a Taxa Efetiva de Imposto (TEI) foi definida das 3 seguintes formas: TEI1 sendo um logaritmo do rendimento coletável dividido pelo GAI (Ganhos antes de Impostos), TEI2 sendo um logaritmo do rendimento coletável dividido pelo GAI normalizado e TEI3 como um algoritmo do montante pago em Impostos dividido pelo GAI normalizado.

A amostra é constituída por 450 Empresas Publicas de 18 países Europeus e de 8 diferentes sectores de atividade. Listadas no Stoxx Euro 600 no período de 2012 a 2018.

As variáveis independentes utilizadas foram a Dimensão da Empresa, a profitabilidade, a Alavancagem Financeira, a "intensidade de capital" e o Inventário, enquanto que as variáveis dependentes são as Taxas Efetivas de Imposto (TEI).

Os resultados mostram um sinal negativo para a Dimensão da Empresa, Alavancagem Financeira, Capital Intensivo e Lucratividade. No entanto, mostram um resultado positivo na relação entre a percentagem de Inventário e a Taxa Efetiva de Imposto.

Palavras-Chave: Taxa Efetiva de Imposto; Dimensão da Empresa; Alavancagem Financeira; Capital Intensivo; Percentagem de Inventário; Lucratividade.

Acknowledgement

I would like to particularly thank Professor Joaquim Miranda Sarmento for his valuable supervision and his advices during this research project.

I like to thank my fiancé, my parents, and my sister for their support, without whose help this work would never have been possible.

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Abbreviations

CAPITAL-INTENS – Capital Intensity

ETRs – Effective Tax Rates

INVENT-PERC – Inventory Percentage

LEV – Leverage

ROA – Return on Assets

SIZE – Firm Size

UK – United Kingdom

USA – United States of America

1. Introduction

Effective tax rate has always been an important issue for companies. Hence determinants of the effective tax rate (ETR) have received much attention among previous literature during the past decades (e.g., Stickney & McGee, 1982; Zimmerman, 1983; Shackelford and Shevlin, 2001; Dailimi & Setyowati 2020; Tijjani and Peter (2020). Quite notable numbers of the determinants of ETR such as firm size, growth, leverage, foreign operations, legislation change, CEO performance, ownership structure, capital structure, mix asset, cash flow, CEO publicity, and board of directors and external auditors' quality had been studies in the previous literature (e.g., Bohm, Riedel and Simmler, 2016). This study calls into question the effects of firm characteristics including firm size, leverage, capital intensity, capital inventory and profitability on ETR in European countries.

Firm size has been considered as a critical determinant for ETR. As one of the most mentioned determinants of ETR, firm size has been studied through Political cost theory and Political power theory. The study of Zimmerman (1983) as one of the initial works on determinants of ETR, indicated a positive relationship between firm size and ETR. Many studies after had confirmed their findings, such as Calve-Perez et al., 2005 and Noor, Fadzillah & Mastuki, 2010; On the other hand, studies rely on political power theory such as Porcano (1986) showed a negative relationship between firm size and ETR. Yet, there are studies that showed no significant relationship between these two or did not consider any of these theories, for example (Janssen & Buijink, 2000). Besides, there are some studies such as study of Holland (1998) that found both positive, negative and no significant association between firm size and ETR due to variety of conditions.

Firm size has received much attention in the last few years and most studies have mainly focused on its relationship with ETR, until Stickney and McGee (1982) and later Gupta and Newberry (1997), mentioned the effect of leverage and asset

mix (capital intensity) on ETR too. Thereafter, the relationship between leverage and ETR has received extensive attention both theoretically and empirically in the literature (e.g., Delgado, Fernandez-Rodriguez & Martinez-Arias, 2014) and similar to firm size, there was not a corresponding result considering the relationship between leverage and ETR (e.g., Gupta & Newberry,1997; Plesko, 2003). The literature shows no consensus on the relationship between asset mix, intensity percentage nor profitability and ETR in the same way.

Our data collected from Stoxx Euro 600 over the period of 2002-2018 from Refinitiv. A sample of 450 public firms from 18 European countries were enlisted. For our first regression OLS we checked fixed effect, for the second regression OLS year, country and sector effects have been considered, for the third OLS, economic sector was checked, for the fourth regression OLS we were checked country, for the fifth regression OLS a Driscoll-Kraay regression were considered and finally for the last regression OLS multilevel fix effect linear regression has been used.

This paper is organized as follows. The second section gives a brief overview of literature. the research data is presented in the third section. Section 4 reports and analyses the data. Our conclusions are drawn in the final section.

As previously mentioned, this paper defined effective tax rates in three ways. ETR1 was defined as Logarithm of income tax divided by EBT, ETR2 as logarithm of income tax divided by normalized EBT, and ETR3 as Logarithm of cash tax paid divided by normalized EBT.

2. Literature Review

Determinants of ETR have received much attention over the last decades. Effective Tax Rates are measure in various way amongst previous studies. There are several measure of ETRs, that depends on the research question for instance, Federal, Foreign, State, and Local Income Taxes Payable divided by Pre-tax Book Income minus the division of Deferred Tax Expense by Statutory Tax Rate by Stickney and McGee (1982); Income Taxes divided by operating cashflow by Zimmerman (1983), Current Federal tax expense divided by pre-tax book income minus equity income from unconsolidated firms plus income from minority interests by Porcano (1986), the amount of tax paid by a firm in relation to its gross profit by Harris and Feeny (2000). At the end as mentioned by Harris and Feeny (2000) and (2003), the definition of ETRs in each research depends on the study question. Although there are various appropriate equations to measure ETRs, ETRs generally are measured based on information collected from financial statements as tax liability divided by income (e.g., Wilkie and Limberg, 1993; Plesko, 2003).

The most studied determinants of ETR in previous works are: firm size, growth, leverage, foreign operations, legislation change, CEO performance, ownership structure, capital structure, mix asset, ownership, cash flow, CEO publicity, and board of directors, political connections, foreign income, and many more (e.g. Gupta and Newberry, 1997; Holland, Suyono, 2018). As stated in the Introduction, this study aimed to study the consequences of firm size, leverage, capital intensity, inventory percentage and profitability on ETRs.

A summary of all the papers that have been cited in this study would be mentioned later in Table I.

2.1 Firm Size

Reviewing literature about determinants of ETRs shows that Firm size has been studied the most, although the findings are not conclusive. The majority of the previous studies defined the relationship between firm size and ETR through two principal theories; Political cost theory and political power theory (e.g., Zimmerman, 1983; Wilkie & Limberg, 1990;). There are still studies that did not find any significant relationship between firm size and ETR neither through the political cost theory nor the political power theory (e.g., Stickney & McGee, 1982). In addition to studies that mentioned different kind of relationship between firm size and ETRs including positive, negative and not significant (e.g., Holland 1998).

In this regard, the meta-analysis of Belz et al., (2019), supported the stated conclusions. In a meta-regression analysis, they quantitatively reviewed the empirical literature on the relation between effective tax rate (ETR) and firm size. From the 56 primary studies that they reviewed, 20 studies provided evidence for the political cost theory (e.g., Watts and Zimmerman, 1986), 11 studies provided evidence for the political power theory (e.g., Gupta & Newberry, 1997), 14 studies did not support any of these two theories (e.g Stickney & McGee, 1982), and 11 studies provide evidence for both the political cost theory and the political power theory (e.g., Wu et al., 2012).

According to the political cost theory, there is a positive relationship between size and ETR (e.g., Omer et al., 1993; Irianto et al., 2017). Watts and Zimmerman (1986) as the ones who developed Political cost theory, underlined that "Under the political cost theory, the higher visibility of larger and more prosperous firms causes them to become victims of greater regulatory actions by the government and wealth transfers" (Watts and Zimmerman, 1986, p. 235). It means that biggest are the companies, the greater they suffer from taxation as a result of the greater governmental control. In other words, due to the political cost theory, firms with larger sizes have higher corporate effective tax rates.

On the other hand, the Political power theory asserted a negative relationship between firm size and ETR (e.g., Porcano, 1986; Derashid & Zhang, 2003). It means the bigger the companies are, the greater possibilities they have to diminish taxes. This statement leads to a negative association between corporate size and ETR.

Wilkie and Limberg (1990) designed a study to recognize the reason of this conflicting result between study of Zimmerman (1983) and Porcano (1986). They revealed that this difference could be due to large difference in their sample selection procedures, ETR definition, firm size measures and date regression techniques.
Additionally, there are studies which did not find any significant relationship between firm size and ETR such as Wilkinson et al., (2001), Liu & Cao, (2007) For example, as one of the primitive studies in this context Gupta and Newberry (1997) through a micro-level longitudinal study showed that in firms with longer histories, ETRs are not related to firm size.

Amongst studies that supported the relationship of firm size and ETR through both theories, Wu et al., (2012) in an empirical study suggested that state-controlled firms political power theory shows a positive relationship between size and ETR, while privately controlled firms political cost theory explains a negative relationship. Whereas, for those firms that already enjoy preferential tax status, there is no significant relationship between size and ETRs (Wu et al., 2012).

Finally, there are studies that have found a nonlinear relation between size and ETR, which means up to a certain size the relation is positive but from that size on the biggest companies suffer less fiscal pressure (e.g., Fernandez-Rodriguez & Martinez-Arias, 2011; Fonseca-Diaz et al., 2011). These studies tried to explain this inconsistency in literature by defining a non-linear relationship between firm size and ETR.

Considering the mentioned theoretical perspectives and taking into account the prior research (e.g., Porcano (1986); Stickney and McGee (1982)). there is a remarkable inconsistency in the literature studying the effects of Firm size on ETR. This incompatible result could be due to various determinants such as the

geographical areas and firm sector used in each study. Consequently, it can be mentioned that any relationship between firm size and ETR could be expected. In this way, our first hypothesis establishes this relationship as follows:

Hypothesis 1: Firm size affects ETR

2.2 Leverage

After firm size, the relationship between leverage [(1)] and ETR has received extensive attention both theoretically and empirically (e.g., Stickney & McGee,1982; Delgado et al 2014). Like the association of firm size and ETR the results were not corresponding in previous studies.

There exists a considerable body of literature on the effects of leverage on ETR suggested a negative relation between leverage and ETR (e.g.; Derashid & Zhang 2003;; Calve-Perez et al., 2005). While some other studies found a positive relation between leverage and ETR (e.g., Chen et al., 2010). Meanwhile, there were studies such as Kim & Limpaphayom (1998), Wilkinson et al. (2001) and Irianto et al., (2017) that found no significant relation between these 2 variables. Finally, some studies tried to explain these differences by defining a non-linear relation between debt and ETR (e.g., Fernandez-Rodriguez & Martinez-Arias, 2011; Delgado et al., 2012). Due to the unsolid findings of previous studies on the effects of leverage on ETR, in this study either positive or negative results could be expected. As such, hypothesis 2 has been established:

Hypothesis 2: Firm leverage effects ETR.

2.3. Capital intensity

In line with the findings of other determinants of ETR that was mentioned above, the literate predicts a contradistinctive result concerning the relation between

[1] In some studies leverage has been named as debt

capital intensity [1] and tax burden (e.g., Delgado et al, 2014). A significant number of empirical studies that investigated Capital intensity as a determinant of ETR, show a negative relation between these two (e.g., Richardson & Lanis, 2007).

There is also research that showed a direct relation between capital intensity and ETR (e.g., Janssen & Buijink, 2000; Wilkinson et al., 2001; Wu et al., 2012). However, some studies did not find any significant relation between these two variables (e.g., Liu & Cao, 2007; Irianto et al., 2017).

Meanwhile Fernandez-Rodriguez & Martinez- Arias, (2011) and Delgado et al., (2012) find a non-linear relation between capital intensity and fiscal pressure. Majority of studies on Europe market revealed a negative relationship between Capital Intensity and ETRs. Saying that we establish our third hypothesis:

Hypothesis 3: Capital intensity effects ETR negatively.

2.4. Inventory Percentage

Due to our findings, few studies have been published investigating the relationship between Inventory Percentage and ETR. Among studies that consider this relationship, there are some that suggesting a positive association between inventory percentage and ETR such as Gupta and Newberry (1997), Richardson and Lanis, (2007) and Wu et al., (2012). While some other studies didn't find any significant association between these two variables (e.g., Derashid and Zhang, 2003; Adhikari et al., 2006). In some cases, however, a nonlinear relationship has been found (e.g., Delgado, Fernandez-Rodriguez & Martinez-Arias, (2018); Drawing on these previous studies since majority of studies mentioned the positive relationship between Inventory Percentage and ETR, we formulated the following hypotheses:

Hypotheses 4: Inventory - Intensity has a positive relationship with ETRs.

[1] In some studies Capital Intensity has been named as asset mix

2.5. Profitability

The contradistinctive disclosure regarding the determinants of ETR continued in the relation between Profitability and ETR. The empirical studies show a positive relationship between profitability and ETR (e.g., Richardson & Lanis, 2007; Chen et al., 2010). Still, some studies for example the ones that specifically investigate this relation in Malaysia Market and not the USA market revealed a negative relationship between these two (Derashid & Zhang, 2003; Noor, Matsuki, & Bardai, 2008; Noor et al., 2010). Whereas some studies didn't find any significant relation (e.g., Fonseca-Diaz et al., 2011; Irianto et al., 2017). Despite the inconsistency in the prior research, in this study, a positive relationship between profitability and ETR is expected. Thus, we formulate our fifth hypothesis:

Hypothesis 5: Firm profitability positively affects ETR.

Table I-Literature Review Summary

Year	Name	Country	Variable	Effect
1972	Siegfried	N/A	Firm size	Negative (Political Power Theory)
1982	Stickney & McGee	USA	Firm size	Not significant
			Leverage	Negative
			Capital intensity	Negative
			Profitability	Positive
1983	Zimmerman	USA	Firm size	Positive
1986	Porcano	USA	Firm Size	Negative (Political Power Theory)
1986	Watts & Zimmerman	USA	Firm Size	Positive (Political Cost Theory)
1990	Wilkie & Limberg	N/A	Firm size	Relationship b/w Firm Size and ETR depends on the empirical procedures
1993	Omer et al.	N/A	Firm Size	Relationship b/w Firm Size and ETR depends on the measures
1997	Gupta & Newberry	USA	Firm size	Not Significant
			Leverage	Negative
			Capital intensity	Negative
			Inventory	Positive
			Profitability	Positive

1998	Holland	UK	Firm Size	1968-1979: positive relationship between firm size and ETR 1980-1993: weaker relationship between firm size and ETR late 1970s and the start of the 1980s: negative relationship between firm size and ETR
1998	Kim & Limpaphayom	Hong Kong	Firm size Leverage	Negative- Political Power theory Not significant
1999	Buijink, Janssen & Schols	EU	Firm Charactristics	Not significant
2000	Harris & Feeny	Australia	Firm Size Leverage	Negative Positive
2000	Janssen & Buijink	Netherlands	Capital intensity	Positive
2001	Gordon & Lee	USA	Firm Size	Positive
2001	Shackelford & Shevlin	–	Tax and Non-Tax factors	Empirical income tax research in accounting
2001	Wilkinson, Cahan & Jones	Netherlands	Firm size Leverage Capital intensity	Not significant Not significant Positive
2002	Buijink, Janssen & Schols	EU	Average ETR from financial statements	The provision of tax incentives differs substantially between EU Tax incentives do not have the effect of equalizing actual corporate tax burdens in the EU
2003	Derashid & Zhang	Malaysia	Firm size Leverage Capital intensity Inventory Profitability	Negative- Political Power theory Negative Negative Not significant Negative
2003	Harris & Feeny	Australia	Firm size Leverage	Negative- Political Power theory Positive
2003	Plesko	USA	Leverage Capital intensity Profitability	Not Significant Positive Positive
2003	Rego	USA	Firm Size	Negative- Political Power theory
2004	Fernández-Rodríguez	Spain	Firm size Leverage Capital intensity Profitability	Not significant Negative Not significant Positive

2005	Calvé-Pérez Serer& Llopis	Spain	Firm size Leverage Capital intensity Profitability	Positive Negative Negative Positive
2005	Feeny, Gillman & Harris	Australia	Firm size Leverage Capital intensity	Not significant Positive Positive
2005	Vandenbussche, Crabbé & Janssen	Belgium	Firm Size Leverage Capital intensity	Negative- Political Power theory Positive Negative
2006	Adhikari, Derashid & Zhang	Malaysia	Inventory	Not significant
2007	Liu & Cao	China	Firm size Leverage Capital intensity	Not significant Negative Not significant
2007	Richardson & Lanis	Australia	Firm size Leverage Capital intensity Inventory Profitability	Negative- Political Power theory Negative Negative Positive Positive
2008	Noor, Matsuki & Bardai	Malaysia	Firm Size leverage Capital Intensity Profitability	Positive Negative Negative Negative
2010	Chen, Chen, Cheng & Shevlin	USA	Firm size Leverage Capital intensity Profitability	Negative- Political Power theory Positive Negative Positive
2010	Noor, Fadzillah & Mastuki	Malaysia	Firm size Leverage Capital intensity Profitability	Positive Negative Negative Negative
2011	Fernandez-Rodriguez & Martinez-Arias	USA & EU	Firm size Capital intensity	Non Linear Non Linear

2011	Fonseca Díaz, Fernández-Rodríguez & Martínez-Arias.	Spain	Firm size Leverage Capital intensity Profitability	Non Linear Non Linear Negative Not significant
2012	Delgado, Fernandez-Rodriguez & Martinez-Arias	USA	Firm Size Leverage Capital intensity Profitability	Non Linear Non Linear Nom Linear Positive
2012	Fernández-Rodríguez & Martínez-Arias	China & USA	Profitability	Positive
2012	Wu, Wang, Luo & Gillis	China	Firm size Leverage Capital intensity Inventory Profitability	Non Linear Negative Positive Positive Positive
2013	Bao &Romeo	USA	Firm Size	Positive
2013	Huang, Chen, & Gao	China	Firm Size Leverage Inventory	Positive (Political Cost Theory) Non-Linear Positive
2013	Lietz	N/A	Firm Size Leverage Capital Intensity Profitability	Comprehensive Literature Review
2014	Delgado, Fernandez-Rodriguez & Martinez-Arias	EU	Firm Size Leverage Capital Intensity Inventory Profitability	Non-Linear Non-Linear Non-Linear Non-Linear Non-Linear
2014	Fernández-Rodríguez & Martínez-Arias	BRIC	Firm Size Leverage Inventory Profitability	Significant, Different based on country Positive Significant, Different based on country Significant, Different based on country
2014	Kraft	Germany	Firm Size Leverage Profitability	Positive Negative Negative (indirectly)

2014	Lazăr	Romania	Firm size Leverage Capital Intensity Profitability	Not significant Negative Negative Positive
2016	Bohm, Riedel & Simmler	Germany	Firm Size	Negative
2016	Parisi	Italy	Firm Size Leverage Capital Intensity Inventory Profitability	Positive Negative Negative Negative Negative
2017	Dyreng, Hanlon, Maydew & Thornock	USA	Firm Size	Negative
2017	Irianto, Sudibyo & Wafirli	Indonesia	Firm Size Leverage Capital intensity Profitability	Positive Not significant Not Significant Not significant
2018	Delgado, Fernández-Rodríguez & Martínez-Arias	Germany	Inventory	Non-Linear
2018	Suyono	Indonesia	Leverage	Negative
2019	Belz, von Hagen & Steffens	N/A	Firm size	Review the empirical literature
2020	Dailimi & Setyowati	Indonesia	Firm Size Leverage Profitability	Negative Not Significant Positive
2020	Tijjani & Peter	Nigeria	Leverage Profitability	Not Significant Positive

3. Methodology

In order to identify the effects of firm characteristics including firm size, leverage, capital intensity, capital inventory and profitability on Effective Tax Rate (ETR) in European countries, the mentioned hypothesis were analyzed in this study.

For the sample, we collected data from Stoxx Euro 600 from Refinitiv during 2002 to 2018. A total of 450 public firms were enlisted from 18 European countries [(1).] The firms were categorized in eight various economic sectors [(2).]

As it can be seen in table I UK had the greatest number of firms in total followed by France and Germany while Cyprus had the least with only 1 firm in 1 sector. Industrial were the sector with the greatest number of cases and telecommunication services was the sector with the least.

Table II: Country data review

	Basic Material,	Consumer Cyclicals,	Consumer Non-Cyclicals,	Energy,	Healthcare,	Industrials,	Technology,	Telecommunication Services	Utilities	
Austria	2,00	-	-	1,00	-	1,00	1,00	-	1,00	6
Belgium	2,00	-	2,00	-	2,00	2,00	-	2,00	1,00	11
Cyprus	1,00	-	-	-	-	-	-	-	-	1
Denmark	1,00	1,00	3,00	1,00	7,00	3,00	-	-	1,00	17
Finland	3,00	1,00	1,00	1,00	1,00	4,00	1,00	1,00	1,00	14
France	2,00	20,00	6,00	2,00	5,00	21,00	6,00	3,00	3,00	68
Germany	11,00	14,00	3,00	-	9,00	11,00	6,00	4,00	3,00	61
Ireland	2,00	2,00	2,00	1,00	1,00	1,00				9
Italy	3,00	-	1,00	3,00	3,00	5,00	-	1,00	5,00	21
Luxambyrg	1,00	1,00	-	1,00	-	1,00	-	-	1,00	5
Netherland	3,00	2,00	4,00	3,00	3,00	4,00	3,00	2,00	-	24
Norway	2,00	1,00	3,00	3,00	-	1,00	-	1,00	-	11
Poland	1,00	-	-	1,00	-	-	-	-	1,00	3
Portugal	0,00	1,00	-	1,00	-	-	-	-	1,00	3
Spain	0,00	1,00	-	3,00	1,00	3,00	1,00	2,00	4,00	15
Sweden	4,00	6,00	4,00	1,00	3,00	13,00	2,00	2,00	-	35
Switzerland	5,00	4,00	5,00	1,00	7,00	11,00	4,00	2,00	-	39
UK	10,00	28,00	12,00	5,00	7,00	26,00	9,00	2,00	6,00	105
Total	53,00	82,00	46,00	28,00	49,00	107,00	33,00	22,00	28,00	448,00

[1] . Countries: Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherland, Norway, Poland, Portugal, Spain, Sweden, Switzerland and United Kingdom.

[2] . Sectors: Basic Material, Consumer Cyclicals, Consumer Non-Cyclicals, Energy, Healthcare, Industrials, Technology, Telecommunication Services and Utilities.

3.1 Dependent variable

The dependent variable is represented by ETRs. At the first step Effective Tax Rate (ETR) has been defined through three separate measurement. ETR1 is defined as income tax divided by earning before tax (EBT), ETR2 is defined of income tax divided by normalized EBT and ETR3 is defined as cash tax paid, divided by normalized EBT.

Due to non-normality of residuals, ETR1 could not be considered as income tax divided by EBT. The result can be seen in the in figure 1. Then ETR2 was examined and the same problem had happened. Figure 2 are showing this. Non-normality of residuals has happened the same for ETR3 as it can been seen in figure 3.

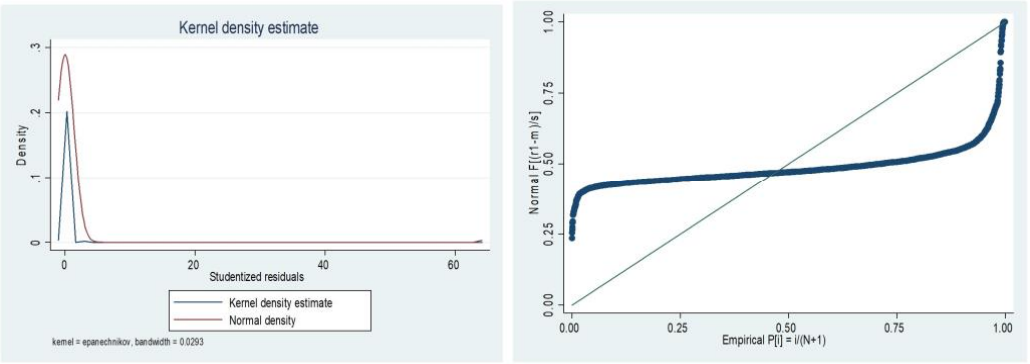

Figure 1. Residuals and Kernel distribution for ETR1

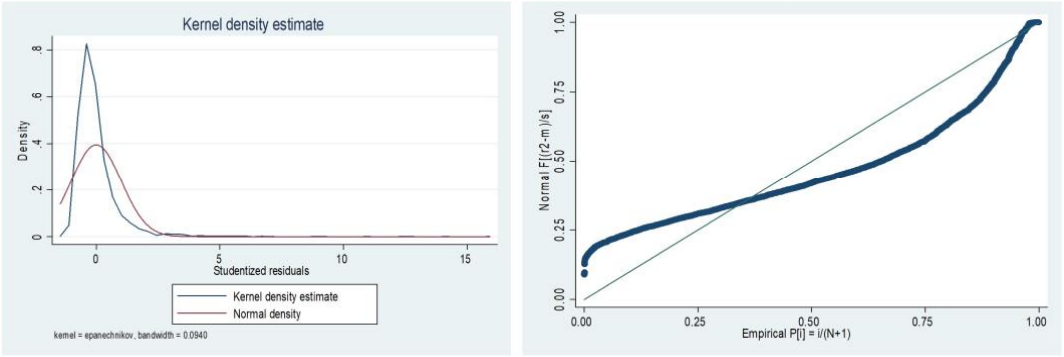

Figure 2. Residuals and Kernel distribution for ETR2

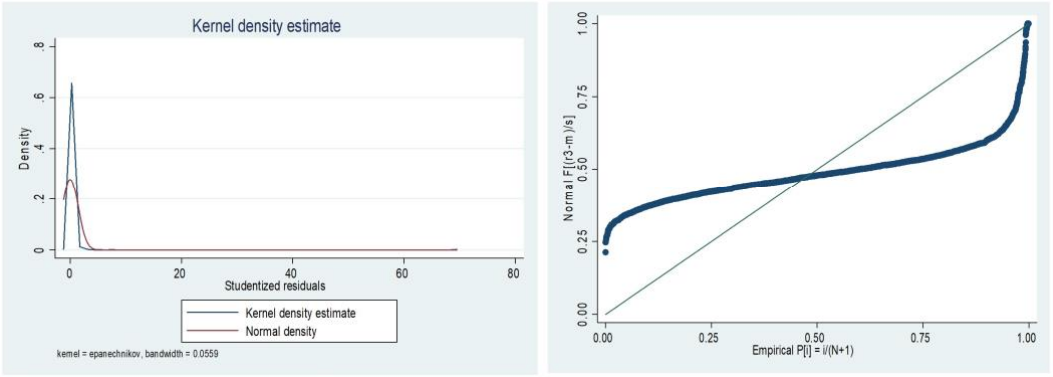

Figure 3. Residuals and Kernel distribution for ETR3

To solve the mentioned problem, ETR1 has been defined as Logarithm of income tax divided by EBT (log $(\frac{income\ tax}{EBT})$), ETR2 as logarithm of income tax divided by normalized EBT (log $(\frac{income\ tax}{normalized\ EBT})$), and ETR3 as Logarithm of cash tax paid divided by normalized EBT (log $(\frac{cash\ tax\ paid}{normalized\ EBT})$).The results of this new measurements could be seen in figures 4,5 and 6. These figures provide the Kernel Density and the Normal Distribution of our explanatory independent variables. Density is on the y-axis and the studentized residuals are on the x-axis.

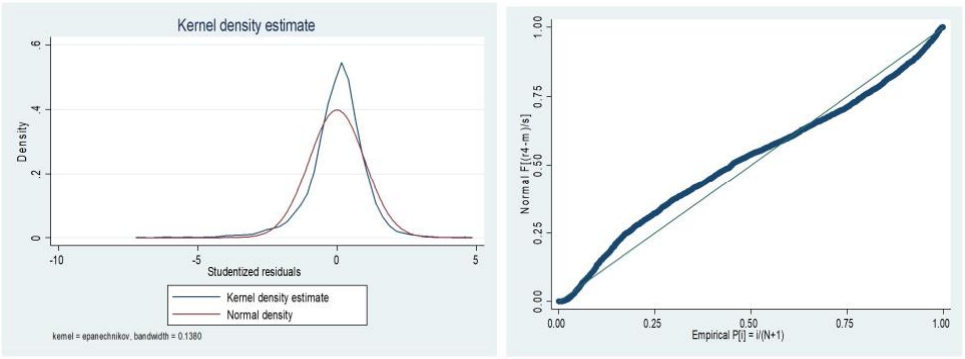

Figure 4. Residuals and Kernel distribution in ETR1 (logarithm) for effective tax rate

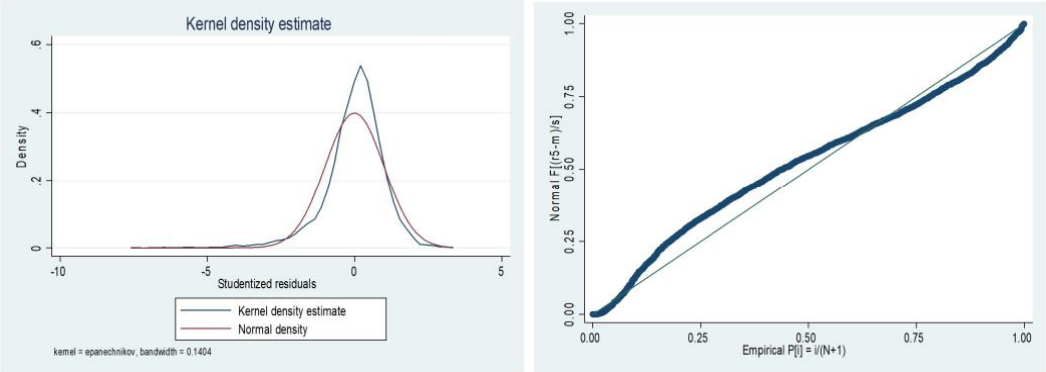

Figure 5. Residuals and Kernel distribution in ETR2 (logarithm) for effective tax rate

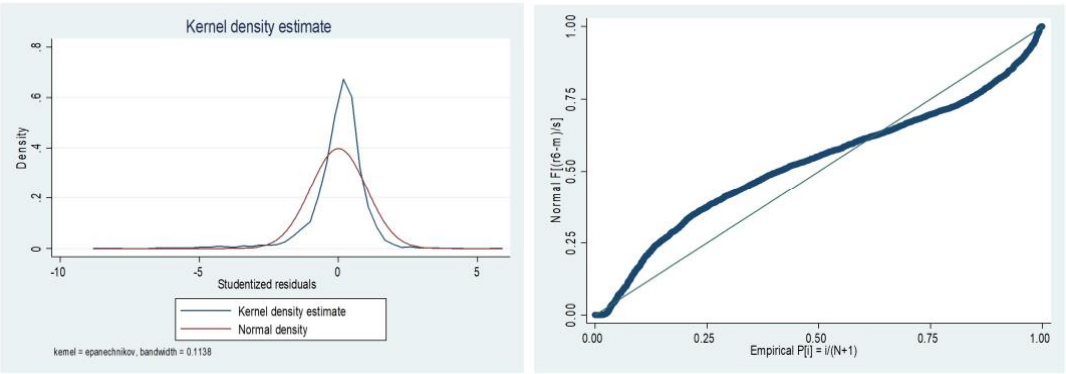

Figure 6. Residuals and Kernel distribution in ETR3 (logarithm) for effective tax rate

3.2. Regression Model

In order to find the effect of our explanatory variables jointly on effective tax rate, the regression model has been used by performing simple regression model using Ordinary Least Square (OLS) method. We performed 6 different OLS. To begin with, for our first OLS we ran HAUSMAN TEST and the p-value was under 0.1 so the fixed effect has been considered. In the second OLS instead of fixed effects, year, country and sector effects have been considered. Furthermore, for the third OLS, all the determinants have been used while we were questioning for economic sector. In the fourth OLS we were also using all determinants yet clustering for country. Afterwards, for the fifth regression all determinants have been

used but a Driscoll-Kraay regression specifically were considered. Lastly for the Sixth OLS we used all determinants, even though a multilevel fix effect linear regression has been used.

Based on the developed hypothesis the following mathematical equation could be formulated:

$$ETR = \alpha_0 + \beta\ Size + \gamma\ LEV + \delta\ CAPIT + \lambda\ INVENP + \mu\ ROA + \varepsilon$$

3.3. Independent variable

As it has been mentioned earlier, FIRM SIZE as our first independent variable is defined as the logarithm of total assets. The next variable is LEVERAGE that assumed as the ratio of total debt to the total asset. Then is CAPITAL INTENSITY as the ratio of a tangible asset to the total asset. Afterwards INVENTORIS has been considered as the ratio of investment to total lost. Last but not least, PROFITIBALITY (ROA) assessed as ratio of earning before tax income to total asset.

Firm size is one the most studied determinant of ETRs, if not the most studied one. In almost all past literature, independent to the findings, firm size has been studied through two major theories: Political Power theory (e.g., Siegfried, 1972) and Political cost Theory (e.g., Watts & Zimmerman, 1986). Belz et al (2019) in a meta-regression analysis showed the diversity in the finding related to the association between firm size and ETRs. They revealed that during the last 40 years, regarding the relationship between firm size and ETRs studies provided evidence for both the political cost theory, for political power theory, or even no significant relationship through either theory, still some studies provide evidence for both theories. In this study, firm size is measured by the logarithm of total assets.

The same as Firm size, Leverage was not free from the inconsistency of findings among the past literature. As it has mentioned above, positive and negative

relationship both were revealed about the relationship of Leverage and ETRs (; Liu & Cao, 2007;Chen et al., 2010). Still, some studies mentioned that there is no significant relationship between these two variables. (e.g., Kim & Limpaphayom, 1998; Wilkinson et al., 2001) or a nonlinear relationship (Fernandez-Rodriguez & Martinez-Arias, 2011; Delgado et al., 2012). In our analysis Leverage is defined as the ratio of total debt to the total assets as used by for example Chen et al., (2010).

The research on the connection between Capital intensity and ETRs was not far from the findings related to firm size and Leverage. He same as these other two variables there were different statement according to the relationship between Capita Intensity and ETRs. In most used sited articles such as Gupta and Newberry (1997), a negative relationship between these two variables were found. Meanwhile Wu et al., (2012) revealed a positive relationship between Capital Intensity and ETRs. In our analysis, Capital intensity would be measured as the BPE net divided by assets.

Not many studies have been found explaining the relationship between Inventory Percentage and ETR. Examples of investigating this relationship are, Adhikari et al., (2006), and Delgado et al., 2018 thought there is no consistency in their findings. The inventory percentage is the inventory divided by assets.

Not surprisingly and in line with findings of our other dependent variables, an inconsistency has noted in the relationship between Profitability and ETRs (e.g., Fernandez- Rodriguez, 2004; Lietz, 2013). However, here a positive relationship between profitability and ETR is expected. We defined Profitability or the return on assets as the EBT divided by assets.

We tested these independent variables for multiclonality. The related correlation matrix has been showed in table III. As it can be seen, all correlations are bellow 0.6, however the correlation between depreciations and the log of assets is close to 0.6. Therefore, it can be said that there could be some multiclonality between depreciations and the log of assets. Consequently, depreciations have not been used.

We used the WALT test for the three dependent variables. Since the used logarithm of ETR1, ETR2 and ETR3 test were zero, in has been concluded that all the regressions are significant in the model. The BREUSCH-PAGAN test was used.

It proved (p-value < 0.1) the existence of heteroscedasticity in our data. Therefore, the standard robust errors were used in our regressions.

The Control variable in our study includes share outstanding, financial crises, country, year and sector. The descriptive statistic of Mean, standard deviation, minimum and maximum for all three types of ETR as our dependent variables and our explanatory variables (Firm size, Leverage, Capital intensity, inventory percentage and Profitability) are summarized in table II (as followed in results section).

TableA III: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
log_etr	4 449	-2,036682	1,128874	-10,34871	3,90838
log_etr2	4 449	-2,144373	1,047467	-10,34871	2,9866
log_etr3	4 449	-1,576852	0,7490263	-8,983064	3,078568
log_assets	4 449	23,03041	1,561629	17,34569	26,88587
lev	4 449	0,1940437	0,1373038	0	1,114315
capital_in~s	4 449	0,2609908	0,2041313	-0,1538729	1,021438
invent_perc	4 449	0,1072759	0,11612	0	0,9597083
roa	4 449	0,0976145	0,1206303	-0,2506526	3,111728
depreciati~s	4 449	9,31E+08	2,28E+09	0	2,45E+10
shares_out~g	4 449	9,71E+08	2,21E+09	217970	3,16E+10
fincrisis	4 449	0,2929137	0,4551431	0	1

Table IV: Correlation Matrix

	log_as~s	lev	capita~s	invent~c	roa	deprec~s	shares~g	fincri~s
log_assets	1							
lev	0,0585	1						
capital_in~s	0,1479	0,2642	1					
invent_perc	-0,2257	-0,4238	-0,2221	1				
roa	-0,2376	-0,2916	-0,0127	0,2679	1			
depreciati~s	0,568	-0,0132	0,2173	-0,1641	-0,023 -	1		
shares_out~g	0,3997	0,0712	0,1609	-0,1536	0,0221	0,4879	1	
fincrisis	-0,0245	0,0138	0,0333	-0,0074	0,0335	0,0155	0,0099	1

4. Result

The aim of this study is to examine the effects of firm characteristics (SIZE, LEV, CAPITAL-INTENS, INVENT-PERC & ROA) on ETR. In order to find out the effect of these firm characteristics on effective tax rate, the regression model has been used by performing a simple OLS regression. As previously mentioned, we measured the effective tax rate in three different way (ETR1, ETR2 & ETR3). We are going to observe the econometric results obtained through our regression mode. The results can be found on table IV, V and VI. Consequently, to statistically assess the determinants of effective tax rate in European countries. Our regressions revealed that the Explanatory variables of Firm size, Leverage, Capital intensity and Profitability jointly are significantly associated with ETRs. More details on this will be given below.

4.1. Hypothesis 1 Firm size and effective tax rate

Regarding our first hypothesis, our tests highlighted a negative relationship between ETR1 and firm size This result is in line with findings of previous studies, for example Stickney and McGee (1982), Derashid and Zhand (2003), Richardson and Lanis (2007). The relationship between firm size and ETR2 has been shown in table V. Similarly, the result showed a negative relation between firm size and ETR2. This is in line with our finding regarding the relationship between firm size and ETR1. In contradiction with earlier findings of ETR1 and ETR2, we found a positive relationship between ETR3 and firm size. This result is consistent with previous results of for example, Zimmerman (1983), Plesko (2003).

Due to various reasons as, big firms have superior resources, they are more involved in profit shifting activities or having more deduction (e.g., Richardson & Lanis, 2007) it is very likely that bigger firms lower the ETR. In other words, firms with large assets can save money so that they will be able to pay to shareholders which could be the reason of positive result in ETR3. This could explain in our

negative association between firm size and ETRs in ETR1 and ETR2 versus this positive association in ETR3.

Table V

VARIABLES	(1) log_etr	(2) log_etr	(3) log_etr	(4) log_etr	(5) log_etr	(6) log_etr
log_assets	-0.0733***	-0.0002	-0.0838**	-0.0838	-0.0838**	-0.0838***
	(0.0120)	(0.0139)	(0.0340)	(0.0547)	(0.0319)	(0.0121)
lev	-0.5912***	-0.3966***	-0.6269	-0.6269	-0.6269*	-0.6269***
	(0.1293)	(0.1318)	(0.3553)	(0.4031)	(0.3330)	(0.1304)
capital_intens	-0.7035***	-0.7853***	-0.6025***	-0.6025**	-0.6025**	-0.6025***
	(0.0845)	(0.0947)	(0.1594)	(0.2166)	(0.2355)	(0.0846)
invent_perc	0.3136**	-0.0462	0.3811	0.3811	0.3811	0.3811**
	(0.1522)	(0.1550)	(0.3633)	(0.4548)	(0.3205)	(0.1534)
roa	-4.7149***	-4.9274***	-4.7101***	-4.7101***	-4.7101***	-4.7101***
	(0.2520)	(0.2557)	(0.3237)	(0.4164)	(0.6523)	(0.2535)
shares_outstanding	0.0000***	0.0000***	0.0000**	0.0000***	0.0000***	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
fincrisis		-0.5446***	0.0378	0.0378	0.0378	0.0378
		(0.1188)	(0.0283)	(0.0745)	(0.0413)	(0.0354)
Constant	0.3356	-0.8273**	0.5329	0.5329	0.5329	0.5329*
	(0.2877)	(0.3634)	(0.7752)	(1.3223)	(0.7452)	(0.2894)
Fixed effect	Yes	No	No	No	No	No
Country	No	Yes	No	Yes	No	No
Year	No	Yes	No	No	No	No
Sector	No	Yes	Yes	No	No	No
Observations	4,447	4,447	4,447	4,447	4,447	4,447
R-squared	0.0963		0.0923	0.0923	0.0923	
Number of year	17	17				
Number of groups					17	

Table IV – Result of ETR1

This table presents the results of a OLS regression. First regression OLS the checked for fixed effect, the second regression OLS checked for the year, country and sector effects, the third OLS checked for economic sector, the fourth regression OLS checked for country, the fifth regression OLS checked for Driscoll-Kraay regression, the sixth regression OLS checked for multilevel fix effect linear regression Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.2. Hypothesis 2 Leverage and Effective tax rate

Our experiments showed a negative relationship between leverage (debt) and all 3 ETRs (ETR1, ETR2 & ETR3). Regarding ETR1. Which confirmed a statistically significant negative relationship between leverage and ETR1. ETR3 corroborated with our findings about ETR1. Our findings appear to be well substantiated by for example, Plesko (2003), Pérez, Serer and Llopis (2005), Undoubtedly, firms with higher leverage are expected to have lower ETRs due to the deductible interest expenditure (e.g. Richardson & Lenis (2007); Wu et al, 2012)

4.3. Hypothesis 3 Capital intensity and ETR

In our third hypothesis we examined the relationship between Capital Intensity and ETRs (ETR1, ETR2 & ETR3). Not surprisingly, the results showed negative relationship between Capital Intensity and ETRs. Our findings match well with or hypothesis and also confirms earlier findings of studies such as Gupta and Newberry, (1997), and Deashed and Zhang (2003).

4.4. Hypothesis 4 Inventory intensity

Confirming our fourth hypothesis, there was a positive relationship between inventory percentage with ETRs. Therefore, it can be said that there is a positive relationship between inventory percentage and ETR2. While table II did not show any statistically significant results. This substantiates previous findings in the literature such as Gupta and Newberry (1997), Richardson and Lanis, (2007), etc. Since inventory intensity is a substitute for capital intensity, it can be reasonably assumed that firms with greater inventory percentage have lower ETRs.

Table VI

VARIABLES	(1) log_etr2	(2) log_etr2	(3) log_etr2	(4) log_etr2	(5) log_etr2	(6) log_etr2
log_assets	-0.0547***	0.0146	-0.0644*	-0.0644	-0.0644**	-0.0644***
	(0.0113)	(0.0131)	(0.0323)	(0.0488)	(0.0298)	(0.0114)
lev	-0.4260***	-0.2664**	-0.4682	-0.4682	-0.4682	-0.4682***
	(0.1221)	(0.1247)	(0.3391)	(0.3741)	(0.3141)	(0.1231)
capital_intens	-0.6955***	-0.8292***	-0.5966**	-0.5966***	-0.5966**	-0.5966***
	(0.0798)	(0.0896)	(0.1812)	(0.2002)	(0.2179)	(0.0798)
invent_perc	0.4090***	0.0907	0.4636	0.4636	0.4636	0.4636***
	(0.1437)	(0.1466)	(0.3490)	(0.4208)	(0.2989)	(0.1448)
roa	-3.1152***	-3.1181***	-3.0665***	-3.0665***	-3.0665***	-3.0665***
	(0.2378)	(0.2419)	(0.2026)	(0.4063)	(0.5727)	(0.2393)
shares_outstanding	0.0000***	0.0000***	0.0000**	0.0000**	0.0000**	0.0000***
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
fincrisis		-0.3592***	0.0652	0.0652	0.0652	0.0652*
		(0.1123)	(0.0366)	(0.0766)	(0.0398)	(0.0334)
Constant	-0.3924	-1.5241***	-0.2205	-0.2205	-0.2205	-0.2205
	(0.2715)	(0.3437)	(0.7438)	(1.1563)	(0.6883)	(0.2731)
Fixed effect	Yes	No	No	No	No	No
Country	No	Yes	No	Yes	No	No
Year	No	Yes	No	No	No	No
Sector	No	Yes	Yes	No	No	No
Observations	4,447	4,447	4,447	4,447	4,447	4,447
R-squared	0.0637		0.0595	0.0595	0.0595	
Number of year	17	17				
Number of groups					17	

Table V– Result of ETR2

This table presents the results of a OLS regression. First regression OLS the checked for fixed effect, the second regression OLS checked for the year, country and sector effects, the third OLS checked for economic sector, the fourth regression OLS checked for country, the fifth regression OLS checked for Driscoll-Kraay regression, the sixth regression OLS checked for multilevel fix effect linear regression Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

4.5. Hypothesis 5 Profitability

In our last hypothesis, we tested the relationship between ETRs and Profitability. Interestingly, our findings were consistent with previous findings in the literature such as Derashid and Zhang (2003), Noor et al., (2008). In line with their results we pointed to the negative relationship between Profitability and ETRs. From the table IV we can see the significant negative relationship between profitability. Alike, the results for ETR2 indicates negative relationship. However, we couldn't find any significant results regarding the relationship between profitability and ETR3. This result have similarities with finding of previous studies too such as Fonseca Diaz et al., (2011).

As it has been mentioned before regarding the relationship between firm size and ETRs, a possible explanation for the negative association of profitability and ETRs may be that the profitable companies can do better tax planning which helps them to lessen the ETR (Noor et al., 2010; Irianto, Sudibiyo & Wafirli, 2017).

To put it differently, it is now possible to state that firstly the capital intensity shows the highest statistically significant relationship in ETR1 and ETR2 in all models and in ETR3 in 4 models. Secondly Profitability, were the most statistically meaningful variable for ETR1 and ETR2 in all models. In the third place comes firm size, which were statistically significant in model 4 of ETR1 and ETR 2 and in 5 models for ETR3. Fourthly, leverage shows the most statistically significant in 4 model for ETR1 and in 3 models significant for ETR2 and ETR3.

Last but not least is Inventory percentage with two statistically significant models for ETR 1 and ETR2.

Table VII

VARIABLES	(1) log_etr3	(2) log_etr3	(3) log_etr3	(4) log_etr3	(5) log_etr3	(6) log_etr3
log_assets	0.0404***	0.0113	0.0386*	0.0386**	0.0386**	0.0386***
	(0.0082)	(0.0097)	(0.0192)	(0.0154)	(0.0152)	(0.0081)
lev	-0.3194***	-0.1834**	-0.3208	-0.3208	-0.3208	-0.3208***
	(0.0885)	(0.0921)	(0.2343)	(0.2617)	(0.2399)	(0.0886)
capital_intens	-0.3057***	-0.4159***	-0.2944	-0.2944*	-0.2944	-0.2944***
	(0.0562)	(0.0634)	(0.1619)	(0.1427)	(0.1745)	(0.0559)
invent_perc	0.0159	0.0089	0.0301	0.0301	0.0301	0.0301
	(0.1016)	(0.1055)	(0.1249)	(0.1510)	(0.1522)	(0.1016)
roa	-0.0141	0.1582	-0.0122	-0.0122	-0.0122	-0.0122
	(0.1695)	(0.1764)	(0.2606)	(0.3833)	(0.2587)	(0.1693)
shares_outstanding	0.0000	0.0000***	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
fincrisis		-0.0479	0.0621**	0.0621**	0.0621**	0.0621***
		(0.0820)	(0.0197)	(0.0232)	(0.0231)	(0.0238)
Constant	-2.3614***	-1.4834***	-2.3446***	-2.3446***	-2.3446***	-2.3446***
	(0.1957)	(0.2527)	(0.4660)	(0.3629)	(0.3461)	(0.1955)
Fixed effect	Yes	No	No	No	No	No
Country	No	Yes	No	Yes	No	No
Year	No	Yes	No	No	No	No
Sector	No	Yes	Yes	No	No	No
Observations	4,449	4,449	4,449	4,449	4,449	4,449
R-squared	0.0186		0.0192	0.0192	0.0192	
Number of year	17	17				
Number of groups					17	

Table VI – Result of ETR3

This table presents the results of a OLS regression. First regression OLS the checked for fixed effect, the second regression OLS checked for the year, country and sector effects, the third OLS checked for economic sector, the fourth regression OLS checked for country, the fifth regression OLS checked for Driscoll-Kraay regression, the sixth regression OLS checked for multilevel fix effect linear regression Robust standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, and * $p < 0.1$.

5. Conclusion

This paper examines the determinants of ETRs in European firms. Our data was collected from stoxx Euro 600 from 2002 to 2018 from 450 public firms of 18 European countries. We found a significant negative association between firm size, leverage, capital intensity and profitability and ETRs. On the other hand, this study indicates a positive relationship between inventory percentage and ETRs. These findings add to a growing body of literature on effects of firm characteristics on ETR. Our work clearly has some limitations.

Limitation:

We are aware that our research may have several limitations. The first limitation is a result of the fact that our sample is collected from public firms hence we could not include unlisted firms. Second, our date was limited to a number of European countries. And in Europe only one index had been studied. Third, we could have collected our data in bigger period of time. We didn't have data from all the countries in all of our mentioned years. Nevertheless, we believe our work could be a starting point for more research on this area considering the consequences of firm characteristics on ETR in European countries separately, greater timeline and various indexes. These topics could all be considered for the future work.

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